INTERNATIONAL ECOLOGICAL CLASSIFICATION STANDARD: TERRESTRIAL ECOLOGICAL SYSTEMS OF THE UNITED STATES

EVT Legend
Entire U.S.

February 2009

Reported from NS_Systems v1.11

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This subset of the Terrestrial Ecological Systems of The United States covers ecological systems attributed to the United States. This classification has been developed in consultation with many individuals and agencies and incorporates information from a variety of publications and other classifications.

NatureServe. 2008. International Ecological Classification Standard: Terrestrial Ecological Systems of the United States. Natural Heritage Central Databases. NatureServe, Arlington, VA.

NatureServe
1101 Wilson Blvd, 15th floor
Arlington, VA 22209

These data are extracted from:
NatureServe. 2008. International Ecological Classification Standard: Terrestrial Ecological Systems. Natural Heritage Central Databases. NatureServe, Arlington, VA.

This document may be generally cited as follows:
NatureServe1. 2008. International Ecological Classification Standard: Terrestrial Ecological Systems of the United States. Natural Heritage Central Databases. NatureServe, Arlington, VA.

2061 Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland

Primary Division: 304 Inter-Mountain Basins
Land Cover Class: Forest and Woodland
Spatial Scale and Pattern: Matrix
Diagnostic Classifiers: Aspen - Conifer Mix, Broad-Leaved Deciduous Tree, Forest and Woodland (Treed), Needle-Leaved Tree
Non-Diagnostic Classifiers: Montane (Montane), Montane (Upper Montane), Montane (Lower Montane), Sideslope, Temperate (Temperate Continental), Toeslope/Valley Bottom

Concept Summary: This ecological system occurs on montane slopes and plateaus in Utah, western Colorado, northern Arizona, eastern Nevada, southern Idaho, western Wyoming, and in north-central Montana in the Big Snowy Mountains. It also occurs in localized settings in the Klamath Mountains of California, as well as in the Sierra Nevada and adjacent Great Basin mountains (Inyo, White, Warner, and Modoc Plateau). Elevations range from 1700 to 2800 m. Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials but most typically occur on sedimentary rocks. The tree canopy is composed of a mix of deciduous and coniferous species, codominated by *Populus tremuloides* and conifers, including *Pseudotsuga menziesii, Abies concolor, Abies lasiocarpa, Abies magnifica, Picea engelmannii, Picea glauca X engelmannii, Picea pungens, Pinus contorta, Pinus flexilis, Pinus jeffreyi, Pinus contorta var. murrayana*, and *Pinus ponderosa*. As the occurrences age, *Populus tremuloides* is slowly reduced until the conifer species become dominant. Common shrubs include *Amelanchier alnifolia, Prunus virginiana, Acer grandidentatum, Symphoricarpos oreophilus, Juniperus communis, Paxistima myrsinites, Rosa woodsii, Spiraea betulifolia, Symphoricarpos albus*, or *Mahonia repens*. Herbaceous species include *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa* spp., and *Achnatherum, Hesperostipa, Nassella*, and/or *Piptochaetium* spp. (= *Stipa* spp.), *Achillea millefolium, Arnica cordifolia*, Asteraceae spp., *Erigeron* spp., *Galium boreale, Geranium viscosissimum, Lathyrus* spp., *Lupinus argenteus, Mertensia arizonica, Mertensia lanceolata, Maianthemum stellatum, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Thalictrum fendleri*. Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system. This is the typical meadow edge aspen-conifer setting in the Sierra Nevada where frequently, due to fire suppression, the conifers are replacing aspens.

Alliances:
Blue Spruce - Quaking Aspen Forest Alliance
Limber Pine - Quaking Aspen Forest Alliance
Lodgepole Pine - Quaking Aspen Forest Alliance
Lodgepole Pine Forest Alliance
Ponderosa Pine - Quaking Aspen Forest Alliance
Quaking Aspen - Douglas-fir Forest Alliance
Quaking Aspen Forest Alliance
Subalpine Fir - Quaking Aspen Forest Alliance
White Fir - Quaking Aspen Forest Alliance

Range: This system occurs on montane slopes and plateaus in Utah, eastern Nevada, southern Idaho, western and central Wyoming (in the Bighorn Mountains), and in north-central Montana in the Big Snowy Mountains. Elevations range from 1700 to 2800 m.

Vegetation: The open to moderately closed, mixed evergreen needle-leaved and deciduous broad-leaved tree canopy is composed of short to moderately tall trees and is codominated by *Populus tremuloides* and conifers, including *Pseudotsuga menziesii, Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus contorta, Pinus flexilis*, and *Pinus ponderosa*. As the occurrences age, *Populus tremuloides* is slowly reduced until the conifer species becomes dominant (Mueggler 1988). The sparse to moderately dense understory may be structurally complex and includes tall-shrub, short-shrub and herbaceous layers, or it may be simple with just an herbaceous layer. Because of the open growth form of *Populus tremuloides*, more light can penetrate the canopy than in a pure conifer occurrence. Typically the understory is denser in younger occurrences that are dominated by *Populus tremuloides* and in more mesic sites with open canopies. If present, the tall-shrub layer may be dominated by *Amelanchier alnifolia, Prunus virginiana*, or *Acer grandidentatum*, and short-shrub layer by

Symphoricarpos oreophilus, Juniperus communis, or *Mahonia repens*. Other common shrubs include *Paxistima myrsinites, Rosa woodsii, Spiraea betulifolia, Symphoricarpos albus*, and in wet areas *Salix scouleriana*. Where dense, the herbaceous layer is often dominated by graminoids such as *Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa* spp., and *Achnatherum, Hesperostipa, Nassella*, and/or *Piptochaetium* spp. (= *Stipa* spp.). More sparse herbaceous layers are generally a more even mixture of forbs such as *Achillea millefolium, Arnica cordifolia, Eucephalus engelmannii (= Aster engelmannii), Erigeron speciosus, Fragaria vesca, Galium boreale, Geranium viscosissimum, Lathyrus* spp., *Lupinus argenteus, Mertensia arizonica, Mertensia lanceolata, Maianthemum stellatum, Osmorhiza berteroi (= Osmorhiza chilensis)*, and *Thalictrum fendleri*. Annuals are typically uncommon. The exotic species *Poa pratensis* and *Taraxacum officinale* are more common in livestock-impacted occurrences (Mueggler 1988).

Environment: The aspen-conifer forest and woodland ecological system is very similar to the aspen forest ecological system with regards to environmental characteristics. It is usually found on montane slopes and plateaus in western Wyoming, Idaho, Utah, and eastern Nevada. Elevations range from 1700 to 2800 m. Climate is temperate with cold winters. Mean annual precipitation is greater than 38 cm and typically greater than 50 cm. Occurrences are typically on gentle to steep slopes on any aspect. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials, but most typically occur on sedimentary rocks.
Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable; sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations aspen is restricted by lack of moisture and is found on cooler north aspects and mesic microsites. The soils are typically deep and well-developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loam. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Divisions: 304:C, 306:C
TNC Ecoregions: 6:C, 9:C, 11:C, 18:C, 19:P, 26:C
Mapzones: 3:C, 6:C, 8:?, 9:C, 10:C, 12:C, 15:C, 16:C, 17:P, 18:C, 19:C, 20:C, 21:C, 22:P, 23:C, 24:C, 25:?, 27:P,
28:C, 29:C
Subnations: AZ, CO, ID, MT, NV, UT, WY

Sources
Concept Author(s): K.A. Schulz, mod. M.S. Reid and G. Kittel
Version: 4/20/2006 12:00:00AM
Stakeholders: West
LeadResp: West

2011 Rocky Mountain Aspen Forest and Woodland

Primary Division: 306 Rocky Mountain
Land Cover Class: Forest and Woodland
Spatial Scale and Pattern: Large patch
Diagnostic Classifiers: Broad-Leaved Deciduous Tree, F-Landscape/Medium Intensity, F-Patch/Medium Intensity, Forest and Woodland (Treed), Long Disturbance Interval, Populus tremuloides
Non-Diagnostic Classifiers: Mesotrophic Soil, Mineral: W/ A-Horizon <10 cm, Montane (Montane), Montane (Upper Montane), Shallow Soil, Temperate (Temperate Continental), Ustic

Concept Summary: This widespread ecological system is more common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. An eastern extension occurs along the Rocky Mountains foothill front and in mountain "islands" in Montana (Big Snowy and Highwood mountains), and the Black Hills of South Dakota. In California, this system is only found on the east side of the Sierra Nevada adjacent to the Great Basin. Large stands are found in the Inyo and White mountains, while small stands occur on the Modoc Plateau. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand. Secondarily, it is limited by the length of the growing season or low temperatures. These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative tree cover). The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. In California, *Symphyotrichum spathulatum (= Aster occidentalis)* is a common forb. Associated shrub species include *Symphoricarpos* spp., *Rubus parviflorus, Amelanchier alnifolia*, and *Arctostaphylos uva-ursi*. Occurrences of this system originate and are maintained by stand-replacing disturbances such as avalanches, crown fire, insect outbreak, disease and windthrow, or clearcutting by man or beaver, within the matrix of conifer forests. It differs from ~Northwestern Great Plains Aspen Forest and Parkland (CES303.681)$$, which is limited to plains environments.

Alliances:
Quaking Aspen Forest Alliance
Quaking Aspen Temporarily Flooded Forest Alliance
Quaking Aspen Woodland Alliance
Tobacco-brush Shrubland Alliance

Range: This system is more common in the central and southern Rocky Mountains extending south to the Sacramento Mountains, however, it occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada, as well as west into California. Elevations generally range from 1525 to 3050 m (5000-10,000 feet), but occurrences can be found at lower elevations in some regions. Very small occurrences may be found in a few scattered locations of the Trans-Pecos of Texas.

Vegetation: Occurrences have a somewhat closed canopy of trees of 5-20 m tall that is dominated by the cold-deciduous, broad-leaved tree *Populus tremuloides*. Conifers that may be present but never codominant include *Abies concolor, Abies lasiocarpa, Picea engelmannii, Picea pungens, Pinus ponderosa*, and *Pseudotsuga menziesii*. Conifer species may contribute up to 15% of the tree canopy before the occurrence is reclassified as a mixed occurrence. Because of the open growth form of *Populus tremuloides*, enough light can penetrate for lush understory development. Depending on available soil moisture and other factors like disturbance, the understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs.
Common shrubs include *Acer glabrum, Amelanchier alnifolia, Artemisia tridentata, Juniperus communis, Prunus virginiana, Rosa woodsii, Shepherdia canadensis, Symphoricarpos oreophilus*, and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus, Calamagrostis rubescens, Carex siccata (= Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium, Eucephalus engelmannii (= Aster engelmannii), Delphinium* spp., *Geranium viscosissimum, Heracleum sphondylium, Ligusticum filicinum, Lupinus argenteus, Osmorhiza berteroi (= Osmorhiza chilensis), Pteridium aquilinum, Rudbeckia occidentalis, Thalictrum fendleri, Valeriana occidentalis, Wyethia amplexicaulis*, and many others. Exotic grasses such as the perennials *Poa pratensis* and *Bromus inermis* and the annual

Bromus tectorum are often common in occurrences disturbed by grazing.

Environment: Climate is temperate with a relatively long growing season, typically cold winters and deep snow. Mean annual precipitation is greater than 15 inches and typically greater than 20 inches, except in semi-arid environments where occurrences are restricted to mesic microsites such as seeps or large snow drifts. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand (Mueggler 1988). Secondarily, its range is limited by the length of the growing season or low temperatures (Mueggler 1988). Topography is variable, sites range from level to steep slopes. Aspect varies according to the limiting factors. Occurrences at high elevations are restricted by cold temperatures and are found on warmer southern aspects. At lower elevations occurrences are restricted by lack of moisture and are found on cooler north aspects and mesic microsites. The soils are typically deep and well developed with rock often absent from the soil. Soil texture ranges from sandy loam to clay loams. Parent materials are variable and may include sedimentary, metamorphic or igneous rocks, but it appears to grow best on limestone, basalt, and calcareous or neutral shales (Mueggler 1988).

Divisions: 204:C, 206:P, 304:C, 306:C
TNC Ecoregions: 1:P, 3:C, 4:P, 5:P, 7:C, 8:C, 9:C, 11:C, 12:P, 18:C, 19:C, 20:C, 21:P, 25:C, 26:C, 81:P
Mapzones: 1:C, 3:C, 6:C, 7:C, 8:?, 9:C, 10:C, 12:C, 13:?, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:P, 25:C, 26:C, 27:C, 28:C, 29:C
Subnations: AB, AZ, BC, CA, CO, ID, MT, NM, NV, OR, SD, TX, UT, WA, WY

Sources
Concept Author(s): M.S. Reid, mod. G. Kittel
Version: 4/20/2006 12:00:00AM
Stakeholders: Canada, Midwest, Southeast, West
LeadResp: West

2051 Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland

Primary Division: 306 Rocky Mountain
Land Cover Class: Forest and Woodland
Spatial Scale and Pattern: Matrix
Diagnostic Classifiers: Aridic, F-Landscape/Medium Intensity, F-Patch/Medium Intensity, Forest and Woodland (Treed), Intermediate Disturbance Interval, Moderate (100-500 yrs) Persistence, Montane (Lower Montane), Montane (Montane), Needle-Leaved Tree, RM Montane Mesic Mixed Conifer
Non-Diagnostic Classifiers: Mesotrophic Soil, Mineral: W/ A-Horizon <10 cm, Ridge/Summit/Upper Slope, Shallow Soil, Sideslope, Temperate (Temperate Continental)

Concept Summary: This is a highly variable ecological system of the montane zone of the Rocky Mountains. It occurs throughout the southern Rockies, north and west into Utah, Nevada, Wyoming and Idaho. These are mixed-conifer forests occurring on all aspects at elevations ranging from 1200 to 3300 m. Rainfall averages less than 75 cm per year (40-60 cm), with summer "monsoons" during the growing season contributing substantial moisture. The composition and structure of the overstory are dependent upon the temperature and moisture relationships of the site and the successional status of the occurrence. *Pseudotsuga menziesii* and *Abies concolor* are most frequent, but *Pinus ponderosa* may be present to codominant. *Pinus flexilis* is common in Nevada. *Pseudotsuga menziesii* forests occupy drier sites, and *Pinus ponderosa* is a common codominant. *Abies concolor*-dominated forests occupy cooler sites, such as upper slopes at higher elevations, canyon sideslopes, ridgetops, and north- and east-facing slopes which burn somewhat infrequently. *Picea pungens* is most often found in cool, moist locations, often occurring as smaller patches within a matrix of other associations. As many as seven conifers can be found growing in the same occurrence, and there are a number of cold-deciduous shrub and graminoid species common, including *Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites, Symphoricarpos oreophilus, Jamesia americana, Quercus gambelii*, and *Festuca arizonica*. This system was undoubtedly characterized by a mixed-severity fire regime in its "natural condition," characterized by a high degree of variability in lethality and return interval.

Alliances:
Blue Spruce Forest Alliance
Blue Spruce Woodland Alliance
Douglas-fir Forest Alliance
Douglas-fir Woodland Alliance
Ponderosa Pine - Douglas-fir Woodland Alliance
Tobacco-brush Shrubland Alliance
White Fir Forest Alliance
White Fir Woodland Alliance

Range: This system occurs throughout the southern Rockies, north and west into Utah, Nevada, eastern Wyoming (very southern in the Laramie Range and possibly on Sheep Mountain) and Idaho. Although not common, it does occur in southeastern Oregon but does not extend farther west into the Cascades.

Vegetation: This highly variable ecological system is comprised of mixed-conifer forests at montane elevations throughout the Intermountain West region. The four main alliances in this system are found on slightly different, but intermingled, biophysical environments: *Abies concolor* dominates at higher, colder locations; *Picea pungens* represents mesic conditions; and *Pseudotsuga menziesii* dominates intermediate zones. As many as seven conifers can be found growing in the same occurrence, with the successful reproduction of the diagnostic species determining the association type. Common conifers include *Pinus ponderosa, Pinus flexilis, Abies lasiocarpa var. lasiocarpa, Abies lasiocarpa var. arizonica, Juniperus scopulorum*, and *Picea engelmannii*. *Populus tremuloides* is often present as intermingled individuals in remnant aspen clones or in adjacent patches. The composition and structure of the overstory are dependent upon the temperature and moisture relationships of the site and the successional status of the occurrence (DeVelice et al. 1986, Muldavin et al. 1996).
A number of cold-deciduous shrub and graminoid species are found in many occurrences (e.g., *Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites, Symphoricarpos oreophilus, Jamesia americana, Quercus gambelii*, and *Festuca arizonica*). Other important species include *Acer glabrum, Acer grandidentatum, Amelanchier alnifolia, Arctostaphylos patula, Holodiscus dumosus, Jamesia americana, Juniperus communis, Physocarpus monogynus, Quercus arizonica, Quercus rugosa, Quercus X pauciloba, Quercus hypoleucoides, Robinia neomexicana, Rubus parviflorus*, and *Vaccinium myrtillus*. Where soil moisture is favorable, the

herbaceous layer may be quite diverse, including graminoids *Bromus ciliatus (= Bromus canadensis), Calamagrostis rubescens, Carex geyeri, Carex rossii, Carex siccata (= Carex foenea), Festuca occidentalis, Koeleria macrantha, Muhlenbergia montana, Muhlenbergia virescens, Poa fendleriana, Pseudoroegneria spicata*, and forbs *Achillea millefolium, Arnica cordifolia, Erigeron eximius, Fragaria virginiana, Linnaea borealis, Luzula parviflora, Osmorhiza berteroi, Packera cardamine (= Senecio cardamine), Thalictrum occidentale, Thalictrum fendleri, Thermopsis rhombifolia, Viola adunca*, and species of many other genera, including *Lathyrus, Penstemon, Lupinus, Vicia, Arenaria, Galium*, and others.

Divisions: 304:C, 306:C
TNC Ecoregions: 6:?, 7:?, 8:?, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 26:C
Mapzones: 6:P, 9:?, 12:C, 13:C, 15:C, 16:C, 17:C, 18:C, 21:?, 22:C, 23:C, 24:P, 25:C, 27:C, 28:C, 29:C, 33:?
Subnations: AZ, CO, ID, NM, NV, OR, UT, WY

Sources
Concept Author(s): M.S. Reid
Version: 1/25/2007 12:00:00AM
Stakeholders: West
LeadResp: West

2054 Southern Rocky Mountain Ponderosa Pine Woodland

Primary Division: 306 Rocky Mountain
Land Cover Class: Forest and Woodland
Spatial Scale and Pattern: Matrix
Diagnostic Classifiers: Aridic, F-Patch/Medium Intensity, Intermediate Disturbance Interval (Periodicity/Polycyclic
Disturbance), Mineral: W/ A-Horizon <10 cm, Needle-Leaved Tree, Pinus ponderosa with shrubby understory, Ridge/Summit/Upper Slope, Sand Soil Texture, Very Shallow Soil
Non-Diagnostic Classifiers:

Concept Summary: This very widespread ecological system is most common throughout the cordillera of the Rocky Mountains, from the Greater Yellowstone region south. It is also found in the Colorado Plateau region, west into scattered locations of the Great Basin. Its easternmost extent in Wyoming is in the Bighorn Mountains. These woodlands occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests
typically in warm, dry, exposed sites. Elevations range from less than 1900 m in northern Wyoming to 2800 m in the New Mexico mountains. Occurrences are found on all slopes and aspects; however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on soils derived from igneous, metamorphic, and sedimentary material, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, rockiness, and periods of drought during the growing season. ~Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)$$ in the eastern Cascades, Okanogan, and northern Rockies regions receives winter and spring rains, and thus has a greater spring "green-up" than the drier woodlands in the central Rockies. *Pinus ponderosa* (primarily var. *scopulorum* and var. *brachyptera*) is the predominant conifer; *Pseudotsuga menziesii, Pinus edulis, Pinus contorta, Populus tremuloides*, and *Juniperus* spp. may be present in the tree canopy. The understory is usually shrubby, with *Artemisia nova, Artemisia tridentata, Arctostaphylos patula, Arctostaphylos uva-ursi, Cercocarpus montanus, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Symphoricarpos* spp., *Prunus virginiana, Amelanchier alnifolia* (less so in Montana), and *Rosa* spp. common species. *Pseudoroegneria spicata, Pascopyrum smithii*, and species of *Hesperostipa, Achnatherum, Festuca, Muhlenbergia*, and *Bouteloua* are some of the common grasses. Mixed fire regimes and ground fires of variable return intervals maintain these woodlands, depending on climate, degree of soil development, and understory density.

Alliances:
Ponderosa Pine Forest Alliance
Ponderosa Pine Woodland Alliance

Range: This system is found throughout much of the Rocky Mountains cordillera, from northwestern Wyoming, south through the Rocky Mountains of Colorado and into New Mexico. In Arizona, it occurs on the Mogollon Rim north into the Colorado Plateau region and west into scattered locations of the Great Basin.

Environment: This ecological system within the region occurs at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites at elevations ranging from 1980-2800 m (6500-9200 feet). It can occur on all slopes and aspects, however, it commonly occurs on moderately steep to very steep slopes or ridgetops. This ecological system generally occurs on soils derived from igneous, metamorphic, and sedimentary material, including basalt, basaltic, andesitic flows, intrusive granitoids and porphyrites, and tuffs (Youngblood and Mauk 1985). Characteristic soil features include good aeration and drainage, coarse textures, circumneutral to slightly acidic pH, an abundance of mineral material, and periods of drought during the growing season. Some occurrences may occur as edaphic climax communities on very skeletal, infertile, and/or excessively drained soils, such as pumice, cinder or lava fields, and scree slopes. Surface textures are highly variable in this ecological system ranging from sand to loam and silt loam. Exposed rock and bare soil consistently occur to some degree in all the associations. *Pinus ponderosa / Arctostaphylos patula* represents the extreme with typically a high percentage of rock and bare soil present.
Precipitation generally contributes 25-60 cm annually to this system, mostly through winter storms and some monsoonal summer rains. Typically a seasonal drought period occurs throughout this system as well. Fire plays an important role in maintaining the characteristics of these open-canopy woodlands. However, soil infertility and drought may contribute significantly in some areas as well.

Divisions: 304:C, 306:C
TNC Ecoregions: 8:C, 9:C, 10:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 26:C, 33:?
Mapzones: 12:?, 14:?, 15:C, 16:C, 17:?, 22:C, 23:C, 24:C, 25:C, 26:?, 27:C, 28:C, 29:C, 33:P
Subnations: AZ, CO, ID?, NM, NV, UT, WY

Sources
Concept Author(s): M.S. Reid
Version: 10/1/2007 12:00:00AM
Stakeholders: Canada, Midwest, West
LeadResp: West

2059 Southern Rocky Mountain Pinyon-Juniper Woodland

Primary Division: 306 Rocky Mountain
Land Cover Class: Forest and Woodland
Spatial Scale and Pattern: Matrix
Diagnostic Classifiers: Aridic, Forest and Woodland (Treed), Long Disturbance Interval, Mineral: W/ A-Horizon <10 cm, Needle-Leaved Tree, Pinus edulis, Juniperus monosperma, Shallow Soil, Very Shallow Soil
Non-Diagnostic Classifiers: Butte, Escarpment, F-Landscape/Medium Intensity, F-Patch/Medium Intensity, Foothill(s), Lowland (Foothill), Midslope, Ridge, Temperate (Temperate Continental), Unglaciated

Concept Summary: This southern Rocky Mountain ecological system occurs on dry mountains and foothills in southern Colorado east of the Continental Divide, in mountains and plateaus of north-central New Mexico, and extends out onto limestone breaks in the southeastern Great Plains. These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus, and ridges. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay. *Pinus edulis* and/or *Juniperus monosperma* dominate the tree canopy. *Juniperus scopulorum* may codominate or replace *Juniperus monosperma* at higher elevations. Stands with *Juniperus osteosperma* are representative the Colorado Plateau and are not included in this system. In southern transitional areas between ~Madrean Pinyon-Juniper Woodland (CES305.797)$$ and ~Southern Rocky Mountain Pinyon-Juniper Woodland (CES306.835)$$ in central New Mexico, *Juniperus deppeana* becomes common. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species are more typical of southern Rocky Mountains than the Colorado Plateau and include *Artemisia bigelovii, Cercocarpus montanus, Quercus gambelii, Achnatherum scribneri, Bouteloua gracilis, Festuca arizonica*, or *Pleuraphis jamesii*.

Alliances:
One-seed Juniper Woodland Alliance
Two-needle Pinyon - (Juniper species) Woodland Alliance
Two-needle Pinyon Forest Alliance

Range: This system occurs on dry mountains and foothills in southern Colorado, in mountains and plateaus of northern New Mexico and Arizona, and extends out onto breaks in the Great Plains. It extends south to the Sacramento Mountains, especially the eastern side. The western side has Madrean elements (*Quercus grisea*) and may be classified as Madrean woodland.
Vegetation:
Environment:

Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 20:C, 21:C, 22:P, 27:C, 28:C
Mapzones: 14:?, 15:P, 24:?, 25:C, 27:C, 28:C, 34:P
Subnations: CO, NM

Sources
Concept Author(s): NatureServe Western Ecology Team
Version: 12/22/2006 12:00:00AM
Stakeholders: West
LeadResp: West

2117 Southern Rocky Mountain Ponderosa Pine Savanna

Primary Division: 306 Rocky Mountain
Land Cover Class: Steppe/Savanna
Spatial Scale and Pattern: Large patch
Diagnostic Classifiers: Aridic, F-Landscape/Low Intensity, F-Patch/Low Intensity, Graminoid, Needle-Leaved Tree, Pinus ponderosa with grassy understory, Shallow Soil, Short Disturbance Interval, Woody-Herbaceous
Non-Diagnostic Classifiers:

Concept Summary: This ecological system is found predominantly in the Colorado Plateau region, west into scattered locations in the Great Basin, and north along the eastern front of the southern Rocky Mountains into southeastern Wyoming. These savannas occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from less than 1900 m in central and northern Wyoming to 2800 m in the New Mexico mountains to well over 2700 m on the higher plateaus of the Southwest. It is found on rolling plains, plateaus, or dry slopes usually on more southerly aspects. This system is best described as a savanna that has widely spaced (<25% tree canopy cover) (>150 years old) *Pinus ponderosa* (primarily var. *scopulorum* and var. *brachyptera*) as the predominant conifer. It is maintained by a fire regime of frequent, low-intensity surface fires. A healthy occurrence often consists of open and park-like stands dominated by *Pinus ponderosa*. Understory vegetation in the true savanna occurrences is predominantly fire-resistant grasses and forbs that resprout following surface fires; shrubs, understory trees and downed logs are uncommon. Important species include *Festuca arizonica, Muhlenbergia virescens, Pseudoroegneria spicata, Andropogon gerardii, Schizachyrium scoparium, Festuca idahoensis, Piptatherum micranthum*, and *Bouteloua gracilis*. A century of anthropogenic disturbance and fire suppression has resulted in a higher density of *Pinus ponderosa* trees, altering the fire regime and species composition. Presently, many stands contain understories of more shade-tolerant species, such as *Pseudotsuga menziesii* and/or *Abies* spp., as well as younger cohorts of *Pinus ponderosa*. ~Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (CES306.030)$$ in the eastern Cascades, Okanogan, and northern Rockies regions receives winter and spring rains, and thus has a greater spring "green-up" than the drier woodlands in the central Rockies.

Alliances:
Ponderosa Pine Temporarily Flooded Woodland Alliance
Ponderosa Pine Wooded Tall Herbaceous Alliance
Ponderosa Pine Woodland Alliance

Range: This ecological system is found predominantly in the Colorado Plateau region, west into scattered locations of the Great Basin, and north along the eastern front of the Rocky Mountains of Colorado and Wyoming. Pine woodlands and savannas of the Black Hills and central Montana are now included in ~Northwestern Great Plains - Black Hills Ponderosa Pine Woodland and Savanna (CES303.650)$$, as are woodlands and savannas in Nebraska and northeastern Colorado.
Vegetation:
Environment:

Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 18:C, 19:C, 20:C, 21:C, 26:P
Mapzones: 15:C, 16:?, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:P, 29:C, 33:P
Subnations: AZ, CO, NM, NV, UT, WY

Sources
Concept Author(s): M.S. Reid, mod. K.A. Schulz
Version: 10/1/2007 12:00:00AM
Stakeholders: Midwest, West
LeadResp: West

2119 Southern Rocky Mountain Juniper Woodland and Savanna

Primary Division: 306 Rocky Mountain
Land Cover Class: Steppe/Savanna
Spatial Scale and Pattern: Large patch
Diagnostic Classifiers: Aridic, Graminoid, Juniperus monosperma and grasses, Lowland (Foothill), Mineral: W/ A-Horizon <10 cm, Needle-Leaved Tree, Shallow Soil, Woody-Herbaceous
Non-Diagnostic Classifiers: Intermediate Disturbance Interval, Lowland (Lowland), Moderate (100-500 yrs) Persistence, Temperate (Temperate Continental), Unglaciated

Concept Summary: This ecological system occupies the lower and warmest elevations, growing from 1370 to 1830 m in a semi-arid climate, primarily along the east and south slopes of the southern Rockies and Arizona-New Mexico mountains. It is best represented just below the lower elevational range of ponderosa pine and often intermingles with grasslands and shrublands. This system is best described as a savanna that has widely spaced, mature (>150 years old) juniper trees and occasionally *Pinus edulis*. *Juniperus monosperma* and *Juniperus scopulorum* (at higher elevations) are the dominant tall shrubs or short trees. These savannas may have inclusions of more dense juniper woodlands and have expanded into adjacent grasslands during the last century.
Graminoid species are similar to those found in ~Western Great Plains Shortgrass Prairie (CES303.672)$$, with *Bouteloua gracilis* and *Pleuraphis jamesii* being most common. In addition, succulents such as species of *Yucca* and *Opuntia* are typically present.

Alliances:
One-seed Juniper Woodland Alliance

Range: This system occupies the lower and warmest elevations, growing from 1370 to 1830 m elevation in a semi-arid climate, primarily along the east and south slopes of the southern Rockies and Arizona-New Mexico mountains. This includes the Sacramento Mountains. especially the east side; the west side has Madrean elements but is mostly southern Rocky Mountains.
Vegetation:
Environment:

Divisions: 303:C, 304:C, 306:C
TNC Ecoregions: 20:C, 21:C, 27:C
Mapzones: 24:P, 25:C, 26:?, 27:C, 28:C, 34:P
Subnations: CO, NM

Sources
Concept Author(s): NatureServe Western Ecology Team
Version: 10/5/2004 12:00:00AM
Stakeholders: West
LeadResp: West

2146 Southern Rocky Mountain Montane-Subalpine Grassland

Primary Division: 306 Rocky Mountain
Land Cover Class: Herbaceous
Spatial Scale and Pattern: Large patch
Diagnostic Classifiers: Acidic Soil, Aridic, Cool-season bunch grasses, Graminoid, Herbaceous, Loam Soil Texture, Mineral: W/ A-Horizon >10 cm, Short Disturbance Interval, Silt Soil Texture
Non-Diagnostic Classifiers: F-Patch/Low Intensity, Moderate (100-500 yrs) Persistence, Montane (Montane), Montane (Lower Montane), Shallow Soil, Sideslope, Temperate (Temperate Continental)

Concept Summary: This Rocky Mountain ecological system typically occurs between 2200 and 3000 m elevation on flat to rolling plains and parks or on lower sideslopes that are dry, but it may extend up to 3350 m on warm aspects. Soils resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, slightly acidic, and usually well-drained. An occurrence usually consists of a mosaic of two or three plant associations with one of the following dominant bunch grasses: *Danthonia intermedia, Danthonia parryi, Festuca idahoensis, Festuca arizonica, Festuca thurberi, Muhlenbergia filiculmis*, or *Pseudoroegneria spicata*. The subdominants include *Muhlenbergia montana, Bouteloua gracilis*, and *Poa secunda*. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine, and aspen forests. In limited circumstances (e.g., South Park in Colorado), they form the "matrix" of high-elevation plateaus. Small-patch representations of this system do occur at high elevations of the Trans-Pecos where they present as occurrences of ~*Festuca arizonica - Blepharoneuron tricholepis* Herbaceous Vegetation (CEGL004508)$$. These occurrences often occupy sites adjacent to ~Madrean Oriental Chaparral (CES302.031)$$.

Alliances:
Alpine Bentgrass Herbaceous Alliance
Arizona Fescue Herbaceous Alliance
Bluebunch Wheatgrass Herbaceous Alliance
Curly Bluegrass Seasonally Flooded Herbaceous Alliance
Great Basin Lyme Grass Herbaceous Alliance
Idaho Fescue Herbaceous Alliance
Kentucky Bluegrass Semi-natural Herbaceous Alliance
Mountain Muhly Herbaceous Alliance
Muttongrass Herbaceous Alliance
Needleleaf Sedge Herbaceous Alliance
Parry's Oatgrass Herbaceous Alliance
Sandhill Muhly Herbaceous Alliance
Slim-stem Muhly Herbaceous Alliance
Smooth Brome Semi-natural Herbaceous Alliance
Streambank Wheatgrass Herbaceous Alliance
Thurber's Fescue Herbaceous Alliance
Timber Oatgrass Herbaceous Alliance
Tufted Hairgrass Seasonally Flooded Herbaceous Alliance
Western Wheatgrass Herbaceous Alliance

Range: This system occurs between 2200 and 3000 m elevation in the Colorado Rockies. Where it transitions in Wyoming to ~Northern Rocky Mountain Subalpine-Upper Montane Grassland (CES306.806)$$ still needs to be clarified.

Divisions: 304:C, 306:C
TNC Ecoregions: 18:C, 19:C, 20:C, 21:C
Mapzones: 12:C, 15:C, 16:C, 17:P, 21:P, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:C, 29:C, 33:P
Subnations: AZ, CO, NM, UT, WY

Sources
Concept Author(s): NatureServe Western Ecology Team
Version: 12/22/2006 12:00:00AM
Stakeholders: Midwest, West
LeadResp: West

2159 Rocky Mountain Montane Riparian Systems

Primary Division: 306 Rocky Mountain
Land Cover Class: Woody Wetland
Spatial Scale and Pattern: Linear
Diagnostic Classifiers: Mineral: W/ A-Horizon <10 cm, Montane (Lower Montane), Riverine / Alluvial, Short (50-100 yrs) Persistence, Short (<5 yrs) Flooding Interval (Short interval, Spring Flooding), Unconsolidated
Non-Diagnostic Classifiers:

Concept Summary: This lower montane riparian systems group is found throughout the Rocky Mountains and Colorado Plateau regions within a broad elevational range from approximately 900 to 2800 m. These systems often occur as mosaics of multiple communities that are tree-dominated with a diverse shrub component. Occurrences are found within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. They can form large, wide occurrences on mid-channel islands in larger rivers or narrow bands on small, rocky canyon tributaries and well-drained benches. Stands are also found in backwater channels and other perennially wet but less scoured sites, such as floodplains swales and irrigation ditches. Dominant trees may include *Acer negundo, Populus angustifolia, Populus balsamifera, Populus deltoides, Populus fremontii, Pseudotsuga menziesii, Picea pungens, Populus tremuloides, Salix amygdaloides, Juniperus scopulorum, Picea mariana*, and *Picea glauca*. Dominant shrubs include *Acer glabrum, Alnus incana, Betula occidentalis, Betula papyrifera, Cornus sericea, Crataegus rivularis, Forestiera pubescens, Prunus virginiana, Rhus trilobata, Salix monticola, Salix drummondiana, Salix exigua, Salix irrorata, Salix lucida, Shepherdia argentea*, or *Symphoricarpos* spp. Exotic trees *Elaeagnus angustifolia* and *Tamarix* spp. are common in some stands.

Alliances:
No Alliances

Range: This lower montane riparian system group occurs throughout the Rocky Mountains and Colorado Plateau regions.
Vegetation:
Environment:

Divisions: 303:P, 304:C, 306:C
TNC Ecoregions: 6:P, 7:C, 8:C, 9:C, 11:C, 18:C, 19:C, 20:C, 21:C, 25:C, 68:C
Mapzones: 9:C, 10:C, 12:C, 13:C, 15:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:C, 24:C, 25:C, 26:C, 27:C, 28:C, 29:C, 33:P
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, SD, UT, WA, WY

Sources
Concept Author(s): K.A. Schulz
Version: 2/6/2006 12:00:00AM
Stakeholders: Canada, Midwest, West
LeadResp: West

2055 Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

Primary Division: 306 Rocky Mountain
Land Cover Class: Forest and Woodland
Spatial Scale and Pattern: Matrix
Diagnostic Classifiers: Abies lasiocarpa - Picea engelmannii, Acidic Soil, F-Landscape/High Intensity, F-Patch/High Intensity, Forest and Woodland (Treed), Long (>500 yrs) Persistence, Montane (Upper Montane), Needle-Leaved Tree, RM Subalpine Mesic Spruce-Fir, Ustic, Very Long Disturbance Interval (Seasonality/Summer Disturbance)
Non-Diagnostic Classifiers: Mesotrophic Soil, Mineral: W/ A-Horizon >10 cm, Montane (Montane), Ridge/Summit/Upper Slope, Shallow Soil, Sideslope, Temperate (Temperate Continental), W-Landscape/Low Intensity, W-Patch/Medium Intensity

Concept Summary: Engelmann spruce and subalpine fir forests comprise a substantial part of the subalpine forests of the Cascades and Rocky Mountains from southern British Columbia east into Alberta, and south into New Mexico and the Intermountain region. They also occur on mountain "islands" of north-central Montana. They are the matrix forests of the subalpine zone, with elevations ranging from 1275 m in its northern distribution to 3355 m in the south (4100-11,000 feet). They often represent the highest elevation forests in an area. Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches. Despite their wide distribution, the tree canopy characteristics are remarkably similar, with *Picea engelmannii* and *Abies lasiocarpa* dominating either mixed or alone. *Pseudotsuga menziesii* may persist in occurrences of this system for long periods without regeneration. *Pinus contorta* is common in many occurrences, and patches of pure *Pinus contorta* are not uncommon, as well as mixed conifer/*Populus tremuloides* stands. In some areas, such as Wyoming, *Picea engelmannii*-dominated forests are on limestone or dolomite, while nearby codominated spruce-fir forests are on granitic or volcanic rocks. Upper elevation examples may have more woodland physiognomy, and *Pinus albicaulis* can be a seral component. What have been called "ribbon forests" or "tree islands" by some authors are included here; they can be found at upper treeline in many areas of the Rockies, including the central and northern ranges in Colorado and the Medicine Bow and Bighorn ranges of Wyoming. These are more typically islands or ribbons of trees, sometimes with a krummholz form, with open-meadow areas in a mosaic. These patterns are controlled by snow deposition and wind-blown ice. Xeric species may include *Juniperus communis, Linnaea borealis, Mahonia repens*, or *Vaccinium scoparium*. In the Bighorn Mountains, *Artemisia tridentata* is a common shrub. More northern occurrences often have taller, more mesic shrub and herbaceous species, such as *Empetrum nigrum, Rhododendron albiflorum*, and *Vaccinium membranaceum*. Disturbance includes occasional blowdown, insect outbreaks and stand-replacing fire. Mean return interval for stand-replacing fire is 222 years as estimated in southeastern British Columbia.

Alliances:
Engelmann Spruce Forest Alliance
Fireweed Herbaceous Alliance
Subalpine Fir - Engelmann Spruce - Limber Pine Krummholz Shrubland Alliance
Subalpine Fir - Engelmann Spruce Forest Alliance
Subalpine Fir Woodland Alliance

Range: This system is found in the Cascades and Rocky Mountains from southern interior British Columbia east into Alberta, south into New Mexico and the Intermountain region. This type tends to be very limited in the northern Oregon Cascades.
Vegetation:
Environment:

Divisions: 304:C, 306:C
TNC Ecoregions: 4:C, 7:C, 8:C, 9:C, 11:C, 20:C, 21:C, 26:C, 68:C
Mapzones: 1:C, 6:?, 7:C, 9:C, 10:C, 12:C, 15:C, 16:C, 17:C, 18:C, 19:C, 20:C, 21:C, 22:C, 23:P, 24:P, 25:C, 27:C, 28:C, 29:C
Subnations: AB, AZ, BC, CO, ID, MT, NM, NV, OR, UT, WA, WY

Sources

Concept Author(s): R. Crawford and M.S. Reid, mod. C. Chappell and G. Kittel
Version: 1/25/2007 12:00:00AM
Stakeholders: Canada, Midwest, West
LeadResp: West